INTERNATIONAL MARITIME ORGANIZATION

IMO

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SUB-COMMITTEE ON SAFETY OF NAVIGATION
46th session
Agenda item 7

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NAVIGATIONAL AIDS AND RELATED MATTERS

Report of the Technical Working Group

Note by the Chairman of the Technical Working Group

1 INTRODUCTION

1.1 As instructed by the Sub-Committee, the Technical Working Group on Navigational Aids and Related Matters met from 20 to 22 September 1999, during the forty-fifth session of the Sub-Committee, under the Chairmanship of Mr. K. Fisher (United Kingdom).

1.2 The following Members, Associate Member and international organizations were represented in the Working Group:

CANADA
CHINA
FINLAND
FRANCE
GHANA
GERMANY
HONG KONG, CHINA
JAPAN
LIBERIA
NETHERLANDS
NORWAY
REPUBLIC OF KOREA
RUSSIAN FEDERATION
SWEDEN
TURKEY
UNITED KINGDOM
UNITED STATES

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
INTERNATIONAL FEDERATION OF FREE TRADE UNIONS (ICFTU)
INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION AND LIGHTHOUSE AUTHORITIES (IALA)
INTERNATIONAL RADIO-MARITIME COMMITTEE (CIRM)
INTERNATIONAL FEDERATION OF SHIPMASTERS' ASSOCIATION (IFSMA)
INTERNATIONAL STANDARDIZATION ORGANIZATION (ISO)

NAVIGATIONAL AIDS AND RELATED MATTERS

Shipborne Satellite Radionavigational Receivers

1.2 The Group considered NAV 45/7/5 (IEC) which suggested various amendments to the performance standards for shipborne satellite radionavigational receivers. Based on the IEC suggestions the Group prepared draft revisions of resolution A.819(19) (Performance standards for shipborne global positioning system (GPS) receiver equipment), resolution MSC.53(66) (Performance standards for shipborne GLONASS receiver equipment) and resolution MSC.64(67), Annex 2 (Performance standards for shipborne DGPS and DGLONASS maritime radio beacon receiver equipment), given in annexes 1, 2 and 3, respectively.

2.2 Members were invited to provide their comments and proposals thereon to NAV 46 and also to consider whether the work should be extended to include a revision of resolution MSC.74(69), Annex 1 (Performance standards for shipborne combined GPS/GLONASS receiver equipment).

User requirements for Heading Systems

2.3 At NAV 44 the Group prepared two tables (given in NAV 45/7, annex 3) which provided a first analysis of the instruments available to produce heading information and the instruments which require to be supplied with heading information, together with the accuracies attainable. The object of the tables was to facilitate a study with the object of ensuring that IMO had specified sufficient heading devices to meet all the needs of the carriage requirements. There was insufficient time to continue with the work at NAV 45.

2.4 Members were therefore invited to provide any further comments to NAV 46 and to consider whether a similar exercise would be useful for speed indicating devices.

3 ERGONOMIC CRITERIA FOR BRIDGE EQUIPMENT AND LAYOUT

3.1 The Group considered NAV 45/6 (Germany) which reported on the work of the Correspondence Group on Ergonomic Criteria for Bridge Equipment and Layout, and NAV 45/6/1 (IEC) which reported on progress made by the IEC in revising Publication IEC 60945 to incorporate ergonomic criteria. The Group was tasked with producing Guidelines on Ergonomic Criteria for Bridge Equipment and Layout in support of regulation 15 of the draft chapter V of the SOLAS Convention.

3.2 The Group made various comments with regard to NAV 45/6, as follows:

.1 document NAV 45/6 included a lot of detail. There could be a problem of overlap between NAV 45/6 and other standards used by the shipping industry. Annex 4 gives some examples of other relevant instruments. These documents should be available for use in any subsequent discussion;

.2 whilst the contents of the document generally covered the subject, there could be a need for a further section (5.8) dealing with cognitive as opposed to physical matters;

.3 there could be a need for a definition of a further work station for emergencies; and

.4 there was a case for radars to be not always forward facing as required by paragraph 5.1.2.6.

3.3 The Group generally felt that the Guidelines should include an interrelation with other documents and provide an overview with references of where to look for further detail.

3.4 The Group agreed that there were many applicable standards available on ergonomic issues but that the problem was in a lack of application of standards. The Guidelines should achieve the uniform application of ergonomic standards.

3.5 The Group did not have time to conduct a detailed study of all sections of NAV 45/6 so Members were invited to provide detailed comments and proposals thereon to NAV 46 for consideration.

4 ACTION REQUESTED OF THE SUB-COMMITTEE

The Sub-Committee is invited to consider this report and decide, as appropriate.

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ANNEX 1

Preliminary draft RESOLUTION MSC....(73)
(adopted on ... December 2000)

[REVISED] PERFORMANCE STANDARDS FOR SHIPBORNE GLOBAL POSITIONING SYSTEM (GPS) RECEIVER EQUIPMENT[, 2000]

THE MARITIME SAFETY COMMITTEE,

RECALLING Article (28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto shall be performed by the Maritime Safety Committee [and/or the Marine Environment Protection Committee, as appropriate,] on behalf of the Organization,

RECALLING FURTHER that, in accordance with resolution A.815(19) by which the Assembly adopted the IMO policy for the recognition and acceptance of suitable radionavigation systems intended for international use to provide ships with navigational position-fixing throughout their voyages, the Global Positioning System (GPS) has been recognized as a possible component of the world-wide radionavigation system,

NOTING that shipborne receiving equipment for the world-wide radionavigation system should be designed to satisfy the detailed requirements of the particular system concerned,

RECOGNIZING the need to improve the previously adopted by resolution A.819(19) performance standards for shipborne GPS receiver equipment in order to ensure the operational reliability of such equipment and taking into account the technological progress and experience gained,

HAVING CONSIDERED the recommendation on the revision of resolution A.819(19) made by the Sub-Committee on Safety of Navigation at its forty-sixth session,

1. ADOPTS the Recommendation on [revised] Performance Standards for Shipborne Global Positioning System (GPS) Receiver Equipment [, 2000] set out in the annex to the present resolution;

2. RECOMMENDS Governments to ensure that GPS receiver equipment:

(a) if installed on or after [……], conform to performance standards not inferior to those specified in the annex to the present resolution; and

(b) if installed before [……..], conform to performance standards not inferior to those specified in the annex to resolution A.819(19).

ANNEX

RECOMMENDATION ON **[REVISED]** PERFORMANCE STANDARDS
FOR SHIPBORNE GLOBAL POSITIONING SYSTEM (GPS)
RECEIVER EQUIPMENT **[, 2000]**

1 INTRODUCTION

1.1 The Global Positioning System (GPS) is a space-based positioning, velocity and time system that has three major segments: space, control and user. The GPS space segment will normally be composed of 24 satellites in six orbits. The satellites operate in circular 20,200 km orbits at an inclination angle of 55° with a 12-hour period. The spacing of satellites in orbit will be arranged so that a minimum of four satellites will be in view to users world-wide, with a position dilution of precision (PDOP) of = 6. Each satellite transmits on two "L" band frequencies, L1 (1575,42 MHz) and L2 (1227,6 MHz). L1 carries a precise (P) code and coarse/acquisition (C/A) code. L2 carries the P code. A navigation data message is superimposed on these codes. The same navigation data message is carried on both frequencies.

1.2 Receiver equipment for the GPS intended for navigational purposes on ships with maximum speeds not exceeding ~~50~~ **70** knots should, in addition to the general requirements contained in resolution A.694(17), comply with the following minimum performance requirements.

1.3 These standards cover the basic requirements of position-fixing for navigation purposes only and do not cover other computational facilities which may be in the equipment.

2 GPS RECEIVER EQUIPMENT

2.1 The words "GPS receiver equipment" as used in these performance standards include all the components and units necessary for the system properly to perform its intended functions. The equipment should include the following minimum facilities:

.1 antenna capable of receiving GPS signals;

.2 GPS receiver and processor;

.3 means of accessing the computed latitude/longitude position;

.4 data control and interface; and

.5 position display and, if required, other forms of output.

2.2 The antenna design should be suitable for fitting at a position on the ship which ensures a clear view of the satellite constellation.

3 PERFORMANCE STANDARDS FOR GPS RECEIVER EQUIPMENT

The GPS receiver equipment should:

.1 be capable of receiving and processing the Standard Positioning Service (SPS) signals as modified by Selective Availability (SA) and provide position information in latitude and longitude World Geodetic System (WGS)-84 co-ordinates in degrees, minutes and thousandths of minutes and time of solution referenced to UTC. Means may be provided for transforming the computed position based upon WGS-84 into data compatible with the datum of the navigational chart in use. Where this facility exists, the display should indicate that co-ordinate conversion is being performed, and should identify the co-ordinate system in which the position is expressed;

.2 operate on the L1 signal and C/A code;

.3 be provided with at least one output from which position information can be supplied to other equipment. The output of position information based upon WGS-84 should be in accordance with **international standards**;*

.4 have static accuracy such that the position of the antenna is determined to within 100 m (95%) with horizontal dilution of precision (HDOP) = 4 (or PDOP = 6);

.5 have dynamic accuracy such that the position of the ship is determined to within 100 m (95%) with HDOP = 4 (or PDOP = 6) under the conditions of sea states and ship's motion likely to be experienced in ships; **

.6 be capable of selecting automatically the appropriate satellite-transmitted signals for determining the ship's position with the required accuracy and update rate;

.7 be capable of acquiring satellite signals with input signals having carrier levels in the range of -130 dBm to -120 dBm. Once the satellite signals have been acquired, the equipment should continue to operate satisfactorily with satellite signals having carrier levels down to -133 dBm;

.8 be capable of acquiring position to the required accuracy, within 30 min, when there is no valid almanac data;

.9 be capable of acquiring position to the required accuracy, within 5 min, when there is valid almanac data;

.10 be capable of re-acquiring position to the required accuracy, within 5 min, when the GPS signals are interrupted for a period of at least 24 h but there is no loss of power;

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* **IEC Publication 1162.**

** **Refer to resolution A.694(17), Publications IEC 721-3-6, IEC 945 and IEC 1108-1.**

.11 be capable of re-acquiring position to the required accuracy, within 2 min, when subjected to a power interruption of 60 s;

.12 generate and output **to a display and digital interface*** a new position solution at least once every ~~2~~ **1** s;**

.13 the minimum resolution of position, i.e. latitude and longitude, should be 0.001 minutes; ~~and~~

.14 generate and output to the digital interface course over the ground (COG), speed over the ground (SOG) and universal time co-ordinated (UTC);

.1~~4~~ **5** have the facilities to process differential GPS (DGPS) data fed to it in accordance with the standards of Recommendation ITU-R M.823 and the appropriate RTCM standard. When a GPS receiver is equipped with a differential receiver, performance standards for static and dynamic accuracies (paragraphs 3.4 and 3.5 above) should be 10 m (95%); **and**

.16 be capable of operating satisfactorily in typical interference conditions.

4 PROTECTION

Precautions should be taken to ensure that no permanent damage can result from an accidental short circuit or grounding of the antenna or any of its input or output connections or any of the GPS receiver equipment inputs or outputs for a duration of 5 min.

5 FAILURE WARNINGS AND STATUS INDICATIONS

5.1 The equipment should provide an indication of whether the position calculated is likely to be outside the requirements of these performance standards.

5.2 The GPS receiver equipment should provide as a minimum:

.1 an indication within 5 s if either:

.1.1 the specified HDOP has been exceeded; or

.1.2 a new position has not been calculated for more than ~~2~~ **1** s.**

Under such conditions the last known position and the time of the last valid fix, with explicit indication of this state, so that no ambiguity can exist, should be output until normal operation is resumed;

*** Conforming to the IEC 61162 series.**

**** For craft meeting the HSC, a new position solution at least every 0.5 sec is recommended.**

.2 a warning of loss of position; ~~and~~

.3 differential GPS status indication of:

.3.1 the receipt of DGPS signals; and

.3.2 whether DGPS corrections are being applied to the indicated ship's position;

.4 DGPS integrity status and alarm; and

.5 DGPS text message display.

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ANNEX 2

Preliminary draft RESOLUTION MSC.....(73)
(adopted on ... December 2000)

[REVISED] PERFORMANCE STANDARDS FOR SHIPBORNE GLONASS RECEIVER EQUIPMENT[, 2000]

THE MARITIME SAFETY COMMITTEE,

RECALLING Article (28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto shall be performed by the Maritime Safety Committee [and/or the Marine Environment Protection Committee, as appropriate,] on behalf of the Organization,

RECALLING FURTHER that, in accordance with resolution A.815(19) by which the Assembly adopted the IMO policy for the recognition and acceptance of suitable radionavigation systems intended for international use to provide ships with navigational position-fixing throughout their voyages, the Global Navigation Satellite System (GLONASS) has been recognized as a possible component of the world-wide radionavigation system,

NOTING that shipborne receiving equipment for the world-wide radionavigation system should be designed to satisfy the detailed requirements of the particular system concerned,

RECOGNIZING the need to improve the previously adopted by resolution MSC.53(66) performance standards for shipborne GLONASS receiver equipment in order to ensure the operational reliability of such equipment and taking into account the technological progress and experience gained,

HAVING CONSIDERED the recommendation on the revision of resolution MSC.53(66) made by the Sub-Committee on Safety of Navigation at its forty-sixth session,

1. ADOPTS the Recommendation on [revised] Performance Standards for GLONASS Reciever Equipment [, 2000] set out in the annex to the present resolution;

2. RECOMMENDS Governments to ensure that GLONASS receiver equipment:

(a) if installed on or after [……], conform to performance standards not inferior to those specified in the annex to the present resolution; and

(b) if installed before [……..], conform to performance standards not inferior to those specified in the annex to resolution MSC.53(66).

ANNEX

RECOMMENDATION ON [REVISED] PERFORMANCE STANDARDS FOR SHIPBORNE GLONASS RECEIVER EQUIPMENT[, 2000]

1 INTRODUCTION

1.1 The Global Navigation Satellite System (GLONASS) is a space-based positioning, velocity, and time system that has three major segments: Space, Control and User. The GLONASS Space Segment, will normally be composed of 24 satellites placed in three orbital planes with eight satellites in each plane. The satellites operate in circular 19,100 km orbits at an inclination angle of 64.8° and with an 11 h and 15 min period. The spacing of satellites in orbit will be arranged so that a minimum of four satellites will be in view to users world-wide, with a position dilution of precision (PDOP) of ≤ 6. Satellites of the system transmit signals on "L" band frequencies. Each satellite has separate lettered frequencies L1 (1602, 5625-1615.5 MHz).

1.2 Each L1 frequency carries a code standard accuracy (C), which is used in shipborne GLONASS receiver equipment. A navigation data message is superimposed on this code.

1.3 Receiver equipment for the GLONASS intended for navigational purposes on ships with maximum speeds not exceeding ~~50~~ **70** knots should, in addition to the general requirements contained in resolution A.694(17), comply with the following minimum performance requirements.

1.4 These standards cover the basic requirements of position-fixing for navigation purposes only and does not cover other computational facilities which may be in the equipment.

2 GLONASS RECEIVER EQUIPMENT

2.1 The words "GLONASS receiver equipment" as used in these performance standards include all the components and units necessary for the system to properly perform its intended functions. The equipment should include the following minimum facilities:

.1 antenna capable of receiving GLONASS signals;

.2 GLONASS receiver and processor;

.3 means of accessing the computed latitude/longitude position;

.4 data control and interface; and

.5 position display and, if required, other forms of output.

2.2 The antenna design should be suitable for fitting at a position on the ship which ensures a clear view of the satellite constellation.

3 PERFORMANCE STANDARDS FOR GLONASS RECEIVER EQUIPMENT

The GLONASS receiver equipment should:

.1 be capable of receiving and processing the Standard Positioning Service (SPS) signals of the GLONASS system and provide position information in latitude and longitude SGS-90 co-ordinates in degrees, minutes and thousandths of minutes and time of solution referenced to UTC (SU). Means should be provided to transform the computed position based upon SGS-90 into WGS-84 or into data compatible with the datum of the navigational chart in use. Where this facility exists, the display should indicate that the co-ordinate conversion is being performed and should identify the co-ordinate system in which the position is expressed;

.2 operate on the Standard Positioning Service (on lettered L1 frequencies and C code);

.3 be provided with at least one output from which position information can be supplied to other equipment. The output of position information based upon SGS-90 or WGS-84, should be in accordance with **international standards**;*

.4 have static accuracy such that the position of the antenna is determined to within 100 m (95%) with horizontal dilution of position (HDOP) ≤ 4 (PDOP ≤ 6);

.5 have dynamic accuracy such that the position of the antenna is determined to within 100 m (95%) with horizontal dilution of position (HDOP) ≤ 4 (PDOP ≤ 6) under the conditions of sea states and ship's motion likely to be experienced in ships;**

.6 be capable of selecting automatically the appropriate satellite transmitted signals for determination of the ship's position with the required accuracy and update rate;

.7 be capable of acquiring satellite signals with input signals having carrier levels in the range of - 130 dBm to - 120 dBm. Once the satellite signals have been acquired the equipment should continue to operate satisfactorily with satellite signal having carrier levels down to - 133 dBm;

.8 be capable of acquiring position to the required accuracy, within 30 min, when there is no valid almanac data;

.9 be capable of acquiring position to the required accuracy, within 5 min, when there is valid almanac data;

.10 be capable of re-acquiring position to the required accuracy, within 5 min, when the GLONASS signals are interrupted for a period of at least 24 h, but there is no loss of power;

.11 be capable of re-acquiring position to the required accuracy, within 2 min, when subjected to a power interruption of 60 s;

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* IEC Publication 1162.

** Resolution A. 694(17), Publications IEC 721 3-6, IEC 945 and IEC 1108-2.

.12 generate and output **to a display and digital interface*** a new position solution at least once every ~~2~~ **1** s;******

.13 the minimum resolution of position, i.e. latitude and longitude should be 0.001 min; ~~and~~

.14 generate and output to the digital interface course over the ground (COG), speed over the ground (SOG) and universal time co-ordinated (UTC);

.1~~4~~ **5** have the facilities to receive and process differential GLONASS (DGLONASS) data fed to it in accordance with the standards of Recommendation ITU-R M.823. When a GLONASS receiver is equipped with a differential receiver, performance standards for static and dynamic accuracies (paragraphs 3.4 and 3.5 above) should be 10 m (95%);*** **and**

.16 be capable of operating satisfactorily in typical interference conditions.

4 PROTECTION

Precautions should be taken to ensure that no permanent damage can result from an accidental short circuit or grounding of the antenna or any of its input or output connections or any of the GLONASS receiver equipment inputs or outputs for a duration of 5 min.

5 FAILURE WARNINGS AND STATUS INDICATIONS

5.1 The equipment should provide an indication if the position calculated is likely to be outside of the requirements of these performance standards.

5.2 The GLONASS receiver equipment should provide as a minimum:

.1 an indication within 5 s if either:

.1.1 the specified HDOP has been exceeded; or

.1.2 a new position has not been calculated for more than ~~2~~ **1** s.**

Under such conditions the last known position and the time of the last valid fix, with explicit indication of this state, so that no ambiguity can exist, should be output until normal operation is resumed;

.2 a warning of loss of position; ~~and~~

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* Publication IEC 61162 series.

** For craft meeting the HSC, a new position solution at least every 0.5 s is recommended.

*** Refer to resolution A.815(19) on the World-wide Radionavigation System.

.3 differential GLONASS status indication of:

.3.1 the receipt of DGLONASS signals; and

.3.2 whether DGLONASS corrections are being applied to the indicated ship's position;

.4 DGLONASS integrity status and alarm; and

.5 DGLONASS text message display.

***

ANNEX 3

Preliminary draft RESOLUTION MSC...(73)
(adopted on ... December 2000)

[REVISED] PERFORMANCE STANDARDS FOR SHIPBORNE DGPS AND DGLONASS MARITIME RADIO BEACON RECEIVER EQUIPMENT[, 2000]

THE MARITIME SAFETY COMMITTEE,

RECALLING Article (28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto shall be performed by the Maritime Safety Committee [and/or the Marine Environment Protection Committee, as appropriate,] on behalf of the Organization,

NOTING that differential services broadcast information for augmenting the Global Positioning System (GPS) and the Global Navigation Satellite System (GLONASS) to provide the accuracy and integrity required for entrances and harbour approaches and other waters in which the freedom to manoeuvre is limited,

NOTING ALSO that shipborne maritime radio beacon receiving equipment providing augmentation information to position-fixing equipment should be designed to satisfy the detailed requirements of the particular system concerned,

RECOGNIZING the need to improve the previously adopted by resolution MSC.64(67), annex 2 performance standards for shipborne DGPS and DGLONASS maritime radio beacon receiver equipment in order to ensure the operational reliability of such equipment and taking into account the technological progress and experience gained,

HAVING CONSIDERED the recommendation on the revision of resolution MSC.64(67), annex 2 made by the Sub-Committee on Safety of Navigation at its forty-sixth session,

1. ADOPTS the Recommendation on [revised] Performance Standards for Shipborne DGPS and DGLONASS Maritime Radio Beacon Reciever Equipment [, 2000] set out in the annex to the present resolution;

2. RECOMMENDS Governments to ensure that DGPS and DGLONASS maritime radio beacon receiver equipment:

(a) if installed on or after [……], conform to performance standards not inferior to those specified in the annex to the present resolution; and

(b) if installed on or after 1 January 1999 but before […….], conform to performance standards not inferior to those specified in the annex to resolution MSC.64(67), annex 2.

ANNEX

RECOMMENDATION ON [REVISED] PERFORMANCE STANDARDS FOR SHIPBORNE DGPS AND DGLONASS MARITIME RADIO BEACON RECEIVER EQUIPMENT[, 2000]

1 INTRODUCTION

1.1 Differential services broadcast information for augmenting the Global Positioning System (GPS) and the Global Navigation Satellite System (GLONASS) to provide the accuracy and integrity required for entrances and harbour approaches and other waters in which the freedom to manoeuvre is limited. Various service providers are broadcasting differential information applicable to localized areas. Different services provide information for augmenting GPS, GLONASS, or both.

1.2 Receiver equipment for the reception and proper decoding of differential GPS and GLONASS maritime radio beacon broadcasts (fully compliant with **Recommendation** ITU-R M.823) intended for navigational purposes on ships with maximum speeds not exceeding ~~50~~ **70** knots ~~shall~~ **should**, in addition to the general requirements contained in resolution A.694(17)*, comply with the following minimum performance requirements.

1.3 These standards cover the basic requirements of maritime radio beacon receiver equipment providing augmentation information to position-fixing equipment. It does not cover other computational facilities which may be in the equipment.

2 DGPS AND DGLONASS MARITIME RADIO BEACON RECEIVER EQUIPMENT

The words "DGPS and DGLONASS maritime radio beacon receiver equipment" as used in these performance standards include all the components and units necessary for the system to properly perform its intended functions. The equipment should include the following minimum facilities:

.1 antenna capable of receiving DGPS or DGLONASS maritime radio beacon signals;

.2 DGPS and DGLONASS maritime radio beacon receiver and processor;

.3 receiver control interface; and

.4 data output interface.

3 FUNCTIONAL REQUIREMENTS

The DGPS and DGLONASS maritime radio beacon receiver equipment should:

.1 operate in the band of 283.5 to 315 kHz in Region 1 and 285 to 325 kHz in Regions 2 and 3 in accordance with **Recommendation** ITU-R M.823;

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* Refer to IEC 945 Publication.

.2 provide means of automatically and manually selecting the ~~frequency, but operator acknowledgement will be required for each frequency change when in automatic mode~~ **station**;

.3 make the data available for use with a delay not exceeding 100 ms after its reception;

.4 be capable of acquiring a signal in less than 45 s in the presence of electrical storms;

.5 have at least one serial data output that conforms to the relevant international marine interface standard*; ~~and~~

.6 have an omni-directional antenna in the horizontal plane; **and**

.7 be capable of operating satisfactorily in typical interference conditions.

4 PROTECTION

Precautions should be taken to ensure that no permanent damage can result from an accidental short circuit or grounding of the antenna or any of its input or output connections or any of the DGPS and DGLONASS maritime radio beacon receiver equipment inputs or outputs for a duration of 5 min.

5 ALARMS

~~The DGPS and DGLONASS maritime radio beacon receiver equipment should give an alarm if no DGPS or DGLONASS message is received~~.

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* Refer to IEC Publication 1162.

ANNEX 4

SOME EXEMPLES OF OVERLAP BETWEEN VARIOUS IMO, IEC AND ISO INSTRUMENTS

ITEM	IMO Draft Correspondence Group MOPS	IMO Resolutions and Guidelines	ISO Standards	IEC Standards
WORK STATIONS	4. Workstations	MSC/Circ.603 Annex 2 1993	ISO 8468 + Draft ISO 14612	
ERGONOMIC REQUIREMENTS	5.			
BRIDGE LAYOUT	1.1 Field of Vision		ISO 8468 + Draft ISO 14612	
	1.2 Windows		Draft ISO 14612	
	1.3 Arrangement			
	1.4 Accessibility			
WORK ENVIRONMENT	2.		ISO 8468	
WORK STATION LAYOUT	3.1 Consoles		ISO 8468	
	3.2 Integration			
	3.3 Arrangement			
	3.4 Display arrangement			
	3.5 Labelling	IMO A.694(18)		IEC 60945 GR.
	3.6 Lighting		ISO 8468	
ALARMS	4.1 Alarm Management	IMO A.830(19) IMO MSC.64(67) IBS IMO MSC.86(70) INS		IEC 61209 IBS IEC 61924 INS
	4.2 Visual Alarms	As above		
	4.3 Audible Alarms	As above		
INPUT DEVICES	5.			
INFORMATION DISPLAY	6.			
INTERACTIVE CONTROL	7.			
DEFINITIONS	Appendix 1		ISO 8468 + Draft ISO 14612	
EQUIPMENT AT WORKSTATIONS	Appendix 2	MSC/Circ.603, Annex 2, 1993	Draft ISO 14612	